



ASTUCE & TIC



PREDICTION OF THE IMPACT OF URBANIZATION AND CLIMATE CHANGE ON ECOSYSTEMIC SERVICES (WATER AND SOIL)

Astuce & Tic is a unique network of experts bringing together scientific researchers, economists and engineers specializing in agronomy, water and soil resources, and information technology.

Thanks to models available for spatial and dynamic simulation of the environment, Astuce & Tic brings a dimension of prospection, which is indispensable for decision-making tools in order to anticipate and minimize foreseeable effects of territorial development policies along with the integration of climate change impacts. It is a tool to assist public authorities and stakeholders of a given territory towards decision making.

This 3-year project was coordinated by G2C Ingénierie (subsidiary of Altereo), and brought together the competences of Orange labs (Group France Telecom-Orange), INRA of Aix-en-Provence and Avignon (GSE, EMMAH, Agroclim), CEREGE, as well as MEED SA.

The area selected for demonstration was the Plaine de la Crau in the Bouches-du-Rhône department in the South of France. This zone, with an area of 60,000 hectares, is located within the Rhône to the West, the Berre Lake to the East, and the Alpilles to the North. There is a large water table and the climate is Mediterranean. The water for the irrigation of the grasslands (that produce the famous Crau hay, used to feed racehorses) uses 75% of the available water.

INNOVATIONS

Astuce & Tic assisted local public authorities in:

- ▶ **Acquiring a global and integrated vision of their territory** thanks to a set of indicators (artificial land alteration, quality and quantity of water resources and their interactions with land resources, agricultural production, etc.),
- ▶ **Testing multiple scenarios that integrate diverse variables** such as legal constraints, socio-economic dynamics and climate change,
- ▶ **Obtaining a prospective vision of the evolution of resources**, specifically those concerning water and soil.

This integrated approach of the Astuce & Tic program has the primary objective of understanding and anticipating the impact of different pressures (urban expansion, soil impermeability, reduction of available agricultural lands) on the quantity and quality of water resources.

STAKEHOLDERS

Astuce & Tic was developed by a joint consortium comprising of public and private partners.

- ▶ **Public partners:** IINRA (National Institute for Agronomic Research) Lab, CEREGE (European Center for Research and Education in Geoscience and Environment) of the Aix-Marseille University.
 - ▶ **Private partners:** G2C Ingénierie, MEED SAS and Orange Labs (Group France Telecom-Orange).
- Astuce & Tic was recognized by the competitive cluster "Territorial Risks and Vulnerabilities".

IMPLEMENTATION

The territory of the Plaine de la Crau is subject to various types of pressures, all linked to the pattern of urbanization.

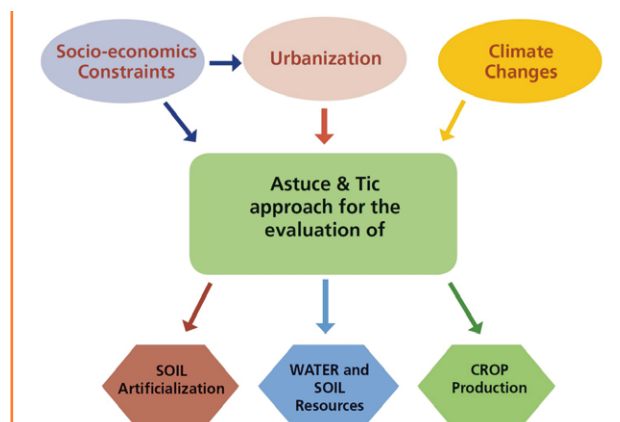
- ▶ Industrial and urban pressure concentrated towards the South and related to the industrial area of Fos,
- ▶ Extension of the urbanization of the communes of Saint-Martin de Crau, Miramas, Salon-de-Provence, and Arles,
- ▶ Stress on the groundwater: sampling, expansion of sewage sludge, rejects,
- ▶ Development of fruit orchards using intensive agricultural practices.

Given the context, it was necessary to equip development actors with the necessary tools to evaluate the environmental impacts of policy-making.

With A&T, land occupation trends are modelled via cellular automaton that allows the calibration of the changes and

provides and estimation of future alterations through the verification of multiple scenarios.

High-res satellite images allowed for the evaluation of the progress and the loss of arable lands.



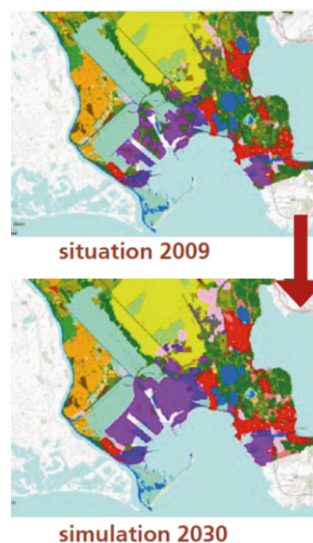
RESULTS

/// In the Plaine de la Crau, A&T proved useful to:

- Measure qualitatively and quantitatively the impact of urban sprawl on land use
- Show that past urbanization has irreversibly destroyed a part of the best agricultural soils, as soil quality was not considered in urban planning
- Evaluate the rapid influence of land use changes on groundwater quality
- Stress the importance of irrigation infrastructure and processes dating back to 16th century. Gravitational irrigation has a protective effect on soil quality (buffering of soil pH)
- Offer a reliable estimation of water demand and withdrawal in all sectors particularly in agricultural species and
- Simulate scenarios of water restriction up to 30%, and show that technical solutions can alleviate its impact on groundwater recharge, water quality (pH, salinity) and crop production.

/// The models were used to evaluate:

- the capacity of the areas to supply water, food and nutrients
- production
- proper flow and quality of drainage



FINANCIAL DIMENSIONS OF THE PROJECT

/// R&D project financed partly by the DGCIS (Direction Générale de la Compétitivité, de l'Industrie et des Services) and partly by the PACA (Provence-Alpes-Côte d'Azur) region.

KEY FIGURES

- ➔ Overall Budget: 3,2 M€
- ➔ Altereo: 1 M€

